

REMARKS

Claims 1-17 are currently pending in the application. Claims 1-17 have been rejected.

The Examiner again objected to the disclosure because page 4, line 20 to page 5, line 1 lists silicon carbide and carbon as examples of inorganic materials. The Applicants have not amended the specification because it is well established in patent law that a patentee is free to be his or her own lexicographer. One skilled in the art may use terms in a manner contrary to or inconsistent with one or more of their ordinary meanings (MPEP §2173.05(b)). Therefore, one of ordinary skill in the art would understand the meaning of silicon carbide fillers and carbon fillers as used in the specification at page 4, line 20 to page 5, line 1. The Applicants respectfully request that the Examiner withdraw the objection to the disclosure.

The Examiner again notes that the application names joint inventors and advises the Applicants of the obligation under 37 C.F.R. §1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made. The Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made. The Applicants reconfirm that each claim was commonly owned at the time the invention was made.

The Examiner rejected claims 1-4, 5, 7, 8, 10, 11, 13, 14, 16, and 17 under 35 U.S.C. §103(a) as being unpatentable over Nakayoshi because Nakayoshi discloses an adhesive composition for bonding a semiconductor chip to an attachment member for the chip comprising a curable polymer composition comprising from 1000 to 1,000,000 weight-ppm spherical filler having an average particle size of from 10 to 100 micrometers and a major axis-to-minor axis ratio of from 1 to 1.5. The Examiner further argues that Nakayoshi discloses that the curable polymer composition can be a curable silicone composition, such as an addition reaction-curable silicone composition. The Examiner further argues that Nakayoshi discloses a semiconductor device comprising a semiconductor chip bonded to an attachment member for the chip by the adhesive composition. The Examiner admits that Nakayoshi does not teach the polymer composition comprising from 1 to 900 weight-ppm spherical filler. The Examiner further argues that Nakayoshi discloses that in a process of manufacturing the adhesive, filler weight-ppm is a result-effective variable. The Examiner concludes that it would have been an obvious matter of design choice ascertainable by routine experimentation to choose the particular claimed filler weight-ppm limitation because the Examiner believes the applicant has not disclosed that the limitations are for

a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another weight -ppm. The Examiner cites MPEP 4144.05 (II).

However, the Examiner further admits that the applicant can rebut a prima facie case of obviousness based on overlapping ranges by showing criticality of the claimed range. The Examiner argues that in such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.

The Examiner further argues that a known or obvious composition such as the instant claimed adhesive composition does not become patentable because it has been described as inferior to some other product for the same use. A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments. A prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose or even preferability of the invention for another purpose. The Examiner deems Applicant's citation of particular portions of the disclosure to support the contention that the claimed invention provides unexpected results over Nakayoshi unpersuasive because disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments.

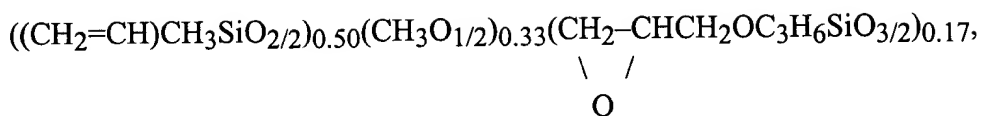
The Examiner deems unpersuasive the applicants' citations of particular portions of the disclosure to support the contention that the instant invention provides unexpected results over Nakayoshi because the Examiner argues that unexpected results must be established by factual evidence, and not by mere argument and that arguments of counsel cannot take the place of evidence in the record. The Examiner further argues that the evidence relied on should establish that the results are in fact unexpected and unobvious and of both statistical and practical significance.

In response to the rejections above, the Applicants reiterate the arguments presented in the reply dated 22 April 2002, the reply dated 31 July 2002, and the appeal brief dated 14 November 2002. Furthermore, the claimed invention is not obvious over Nakayoshi because Nakayoshi teaches that to use an amount of filler less than 1000 weight ppm (0.1 weight %) causes a detriment (pronounced loss of wire bondability) (see paragraph [0021]). Therefore, a filler loading of less than 1000 weight ppm is not merely a nonpreferred embodiment; Nakayoshi explicitly teaches that

the composition cannot have an amount of filler less than 1000 weight ppm. In contrast, the composition of this invention does not contain more than 900 weight ppm of filler. Therefore, the composition of this invention is outside the scope of the composition of Nakayoshi and the compositions of this invention and of Nakayoshi **cannot overlap** as discussed in MPEP 2144.05(II).

In addition, the Applicants respectfully submit that MPEP 2144.05 states that the Applicants can rebut a prima facie case of obviousness and cites MPEP 2145(X)(D). MPEP 2145 (X)(D) provides that, “[p]rior art must be considered in its entirety . . . (MPEP2141.02), and a “proposed modification cannot render the prior art unsatisfactory for its intended purpose” (MPEP 2143.01). MPEP 2143.01 further provides, “Obviousness can only be established by . . . modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found . . . in the references themselves. . . . The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. . . . If the proposed modification would render the prior art invention unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.” Nakayoshi teaches that if the filler loading is under 0.1 weight % (100 weight-ppm), then the detriment of a pronounced loss of wire bondability to the semiconductor pellet after the semiconductor pellet and the semiconductor pellet attachment member have been joined by the adhesive (paragraph 21) is caused. Therefore, taking the disclosure of Nakayoshi in its entirety, one skilled in the art would recognize, based on the disclosure of Nakayoshi, that modifying the composition of Nakayoshi to reduce the amount of filler into the range claimed in this invention would render the composition of Nakayoshi unsatisfactory for its intended purpose, *i.e.*, to provide an adhesive useful for bonding a semiconductor chip to a chip-mounting component without losing wire bondability to the semiconductor chip (Abstract). Rather than providing a teaching, suggestion, or motivation to reduce filler loading, Nakayoshi explicitly teaches away from making the modification to the filler loading.

Furthermore, Example 1 and Comparative Example 2 of this invention illustrate the unexpected results provided by this invention. In Example 1, an adhesive was prepared by mixing the following to homogeneity: 100 weight parts dimethylvinylsiloxyl-terminated dimethylpolysiloxane, 1.5 weight parts trimethylsiloxyl-terminated methylhydrogenpolysiloxane, 1 weight part organopolysiloxane with the average unit formula



0.1 weight part of a 1 weight% isopropanolic chloroplatinic acid solution, 0.05 weight part (this addition gave 500 weight-ppm in the adhesive) of a spherical silica micropowder with an average particle size of 40 μm (standard deviation on the particle size distribution = 3 μm) and an aspect ratio of 1.05, 0.01 weight part 3-phenyl-1-butyne-3-ol, and 2 weight parts fumed silica (average particle size = 30 μm , BET specific surface area = 200 m^2/g) whose surface had been treated with hexamethyldisilazane. When heated for 30 minutes at 150°C, this adhesive produced a silicone rubber that gave a value of 30 for the type A durometer specified in JIS K-6253. Semiconductor devices were fabricated using the adhesive, and after 3,000 cycles, the defect rate was 0%.

In Comparative Example 2, an adhesive was prepared as in Example 1, but in this case using 157 weight parts (this addition corresponded to 60 weight% in the adhesive) of the spherical silica micropowder that was employed in Example 1. The filler loading of Comparative Example 2 corresponds to the filler loading disclosed by Nakayoshi. When heated for 30 minutes at 150°C, this adhesive produced a silicone rubber that gave a value of 48 for the type A durometer specified in JIS K-6253. Semiconductor devices were fabricated using the adhesive, and after 3,000 cycles, the defect rate rose to 55%. Therefore, the applicants have shown that the range for the amount of filler loading produces unexpected results over Nakayoshi and that the results have practical significance because the examples already of record in the specification show improved semiconductor device reliability over compositions of Nakayoshi.

This invention is not obvious over Nakayoshi because Nakayoshi teaches away from this invention, Nakayoshi teaches that modifying the filler loading to the ranges claimed in this invention would destroy the intended purpose of Nakayoshi's composition, and because the Applicants have already provided examples showing unexpected results and practical significance. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of claims 1-4, 5, 7, 8, 10, 11, 13, 14, 16, and 17 under 35 U.S.C. §103(a) over Nakayoshi and allow the claims to issue.

The Examiner rejected claims 1-4, 5, 7, 8, 10, 11, 13, 14, 16, and 17 under 35 U.S.C. §103(a) as being unpatentable over Nakayoshi in view of Sierawski for the reasons discussed above and because Nakayoshi does not teach the polymer composition comprising from 1 to 900 weight-ppm spherical filler, the polymer composition comprising from 1 to 700 weight-ppm spherical filler, or the semiconductor device with a curable polymer composition comprising from 1 to 700 weight-ppm filler. The Examiner further argues that Sierawski discloses an adhesive polymer composition comprising from 1 to 700 weight ppm spherical filler (less than about 20 weight percent). The Examiner concludes that it would have been obvious to combine the product of Sierawski with the product of Nakayoshi because it would provide a filler.

The Examiner further argues that it is well established that the selection of an art recognized element based on its suitability for its intended use supports a prima facie obviousness determination (MPEP 2144.07).

In response to the above rejections, the Applicants reiterate the arguments presented in the reply dated 22 April 2002, the reply dated 31 July 2002, and the appeal brief dated 14 November 2002. Furthermore, the Applicants respectfully submit that they can rebut a prima facie obviousness rejection under MPEP 2145 (X)(D), which provides that, “[p]rior art must be considered in its entirety . . . (MPEP2141.02), and a “proposed modification cannot render the prior art unsatisfactory for its intended purpose” (MPEP 2143.01). MPEP 2143.01 further provides, “Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found . . . in the references themselves. . . . The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. . . . If the proposed modification would render the prior art invention unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.”

One skilled in the art would not be motivated to combine the disclosures of Nakayoshi and Sierawski. Nakayoshi requires that component (D) must be spherical; the major/minor axis ratio of component (D) must be between 1.0 and 1.5 (paragraph 20). Based on the disclosure of Sierawski, one skilled in the art would not know which, if any, fillers would be suitable to use in the composition of Nakayoshi. Silica is the only filler exemplified by Sierawski (col. 8, lines 52-67).

In Example 2 of Nakayoshi, a curable composition is prepared containing 1.1 weight parts of polystyrene beads with a diameter of 20 micrometers (standard deviation of bead diameter

distribution: 1.2 micrometers) and a major/minor axis ratio of 1.06. A semiconductor device produced using the cured product of the composition as adhesive had a malfunction rate of 0/50. In Comparative Example 2 of Nakayoshi, a composition was prepared as in Example 1 except that 15 weight parts of amorphous silica fines with a particle diameter of 40 micrometers and a particle diameter distribution of 3 to 100 micrometers was used instead of the polystyrene beads. A semiconductor device produced using the cured product of the composition as adhesive had a malfunction rate of 50/50. Silica is the only filler exemplified by Sierawski (col. 8, lines 52-67). Finely divided forms of silica are preferred by Sierawski (col. 8, lines 60-61). Nakayoshi teaches away from Sierawski because the filler disclosed by Sierawski does not work in the composition of Nakayoshi, as shown in by comparative example 2 of Nakayoshi.

The Patent Office must identify where the prior art provides a motivating suggestion to make the necessary modifications (In re Jones, 21 U.S.P.Q. 2d 1941, Fed. Cir. 1992). The Examiner argues that it would have been obvious to combine the product of Sierawski with the product of Nakayoshi because it would provide a filler. However, the mere fact that the prior art may be modified as suggested by the Examiner does not make the modification obvious unless the prior art suggests the desirability of the modification (In re Fritch, 23 U.S.P.Q. 2d 1780, Fed. Cir. 1992). Here, Nakayoshi already discloses a filler with specific properties, as discussed above. This filler provides specific benefits, including preserving wire bondability of a semiconductor pellet after the semiconductor pellet has been joined to a semiconductor pellet attachment member (paragraph 20). One skilled in the art would not be motivated to remove component (D) of Nakayoshi and replace it with a filler of Sierawski because nothing in the disclosure of Sierawski teaches or suggests that this would provide a benefit over the filler already disclosed by Nakayoshi as component (D). Nothing in the disclosure of Sierawski teaches or suggests that removing the required component (D) of Nakayoshi and replacing it with a filler of Sierawski would improve preserving wire bondability of a semiconductor pellet after the semiconductor pellet has been joined to a semiconductor pellet attachment member. Furthermore, Example 2 and Comparative Example 2 of Nakayoshi suggest that removing required component (D) and replacing it with another filler, such as the silica disclosed by Sierawski, in an increased amount would be destroy a benefit provided by component (D) of Nakayoshi.

Furthermore, even if one skilled in the art did combine the disclosures of Nakayoshi and Sierawski, this would not provide a reasonable expectation of success to arrive at this invention

based on the disclosures of Nakayoshi and Sierawski because the adhesive composition of this invention comprises a curable polymer composition comprising from 1 to 900 weight-ppm spherical filler. The spherical filler has an average particle size of from 10 to 100 μm and a major axis-to-minor axis ratio of from 1 to 1.5. This invention further relates to semiconductor devices. Sierawski does not teach or suggest the particle size range of the filler. In contrast, in this invention the average particle size of this spherical filler should be between 10 and 100 μm . The basis for this range is as follows. The generation of a constant gap between the semiconductor chip and its mounting component becomes highly problematic in the case of adhesive that uses spherical filler with an average particle size below 10 μm . At the other extreme, the use of spherical filler with an average particle size exceeding 100 μm is undesirable when the generation of an overly large chip-to-mounting component gap is undesirable (p. 4, lines 5-13). Sierawski does not teach or suggest the major axis-to-minor axis ratio of from 1 to 1.5. In contrast, in this invention the aspect ratio of the spherical filler under consideration is within the range from 1 to 1.5. It becomes increasingly difficult to generate a constant chip-to-mounting component gap in the case of adhesive that uses spherical filler whose aspect ratio exceeds the given upper limit (p. 4, lines 13-17). Sierawski does not teach or suggest that the adhesive contains 1 to 900 weight-ppm spherical filler. In contrast, this in this invention it becomes increasingly difficult to obtain a constant chip-to-mounting component gap when the spherical filler content in the adhesive falls below the above-specified lower limit. At the other extreme, an inability to thoroughly relax the mechanical stresses acting on the semiconductor chip becomes increasingly prominent when the above-specified upper limit is exceeded (p. 5, lines 6-13).

One skilled in the art would not be have a reasonable expectation of success to arrive at this invention based on the disclosures of Nakayoshi and Sierawski because Nakayoshi teaches away from Sierawski and from this invention, as discussed above, there is no motivation to combine the disclosures of Nakayoshi and Sierawski, and one skilled in the art would not have a reasonable expectation of success to arrive at this invention by replacing the filler of Nakayoshi with the filler of Sierawski, as discussed above. Therefore, the present invention is not obvious over Nakayoshi in view of Sierawski. The Appellants request that the rejection of claims 1-4, 5, 7, 8, 10, 11, 13, 14, 16, and 17 under 35 U.S.C. §103(a) be reversed and the claims allowed to issue.

The Examiner rejected claims 6, 9, and 15 under 35 U.S.C. §103(a) as being unpatentable over Nakayoshi in view of Sierawski for the reasons discussed above with respect to claims 1-10

and because the Examiner believes the quality of being a thixotropic agent is an inherent property of the composition of the applied prior art. The Examiner further argues that Sierawski discloses a curable epoxy resin composition comprises a filler that has a specific surface area of 50 to 500 m²/g (at least 50 square meters per gram). The Examiner concludes that it would have been obvious to combine the product of Sierawski with the product of Nakayoshi because it would provide a polymer composition and a filler.

This invention is not obvious over Nakayoshi in view of Sierawski for the reasons discussed above for claims 1-4, 5, 7, 8, 10, 11, 13, 14, 16, and 17, and therefore this rejection is moot. The Appellants request that the rejection of claims 6, 9, and 15 under 35 U.S.C. §103(a) be reversed and the claims allowed to issue.

The applicants have particularly pointed out and distinctly claimed the subject matter that they regard as their invention, and the instant invention is novel and unobvious. Reconsideration of the application is requested.

The present response is being submitted within the three month response period for response to the outstanding office action. Although the applicants believe in good faith that no extensions of time are needed, the applicants hereby petition for any necessary extensions of time. You are authorized to charge deposit account 04-1520 for any fees necessary to maintain the pendency of this application.

Respectfully Submitted,
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